

KARMENES : The K2+CARMENES low cadence M-dwarf sample for fields 2 and 3

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Low mass stars in the K2 field are relatively faint at optical wavelengths. However, they have stronger fluxes in the nIR. Planets as small as the Earth will cause transits with depths of 0.5-2%. The CARMENES instrument is expected to start operations at the end of 2015. It is a stabilized optical+infrared spectrograph covering from 0.5 to 1.7 microns at R=82,000, whose Doppler precision is at 1 m/s level and will use 600 nights of GTO time at the 3.5m Calar Alto telescope between 2015 and 2018). Such precision and amount of telescope time will allow for the systematic detection of Earth-mass planets in the HZ of low mass stars. M dwarfs, even appearing faint at optical wavelengths (e.g. V,r' ~ 14-18 mag), have sufficient flux in the optical red and nIR to attain the m/s precision. We kindly request to the K2 team to observe as many late type M stars in field 1 as possible. This proposal contains a sample of mid to late M-stars that we could identify. Several planet candidates have been reported in the original Kepler field but they tend to be early type M stars (M0V to M3V, Muirhead et al. 2012 ApJ, Dressing & Charbonneau 2013 ApJ, Martin et al. 2013 A&A). As a result, not much is gained in the red-nIR in terms of flux and follow-up is difficult, if not impossible, with current means such as HARPS-N.

The K2 equatorial mission is a rather unique opportunity to acquire high quality photometry before CARMENES and, hopefully, early planet detections that will benefit both projects. Photometric variability and activity on such late type stars is quite unknown. CARMENES will obtain measurements of active stars to better quantify the Doppler-activity connection. Thus, even if no planet detection occurs in this sample of M dwarf stars, the photometric time-series will have an enormous value to the low mass stars community. CARMENES could also follow-up on very interesting targets on earlier type stars (G & K dwarfs) if necessary.

Mid M-type stars (M2 - M4) were strongly underrepresented in the initial Kepler sample and later M-types (M4-M8) completely inexistent. The habitable zones of such stars have orbital periods of a few days, thus enabling several potential transit detections within each K2 pointing. We propose two samples of well identified M stars around the K2 Fields 2 and 3 position that can be efficiently followed-up with CARMENES. The first sample is composed of bright and high priority targets that are confirmed M-dwarfs and should have the highest priority (K2_Field02_a.xls, K2_Field03_a.xls). The second sample is composed of M-dwarf candidate stars selected by high proper motion (>100 mas/yr) or parallax (>20 mas), brightness (Kmag<13) and color (V-K>2.5) using the 'SIMBAD search criteria' form. This second sample (K2_Field03_b.xls, K2_Field03_b.xls) contains many M5-M8 dwarf candidates that were non-existing in the original Kepler sample.

We have established a dedicated working group to promptly analyze the data (Co-Is of this proposal) and we are in contact with other teams that might exploit the data of the mission to optimize and share data-reduction products. We also submitted follow-up observing proposals including ESO facilities (HARPS bright transits and Doppler-activity analysis, under review) and have institutional access to observing facilities (IAC/Spain – Lucky imaging, IAA & Goettingen - 1m class telescope for further photometric follow-up). Follow-up proposals will be submitted depending on the outcome and quality of Field 0 run.